EXHIBIT 81

IEc

Expert Statement: Rebuttal of Expert Report Provided by Dr. Charles Mullin

Groundwater Damages in the Matter of:

Sullivan et al. v. Saint-Gobain Performance Plastics Corporation

Case No. 5:16-cv-00125-GWC

1 August 2018

Robert E. Unsworth

Prepared for:

Gary A. Davis, Esq.
Davis and Whitlock, P.C.
Attorneys at Law
21 Battery Park Avenue, Suite 206
Asheville, NC 28801

And

Emily J. Joselson, Esq.
Langrock Sperry & Wool, LLP
P.O. Drawer 351
Middlebury, VT 05753

Prepared by:

Robert E. Unsworth
Principal
Industrial Economics, Incorporated
2067 Massachusetts Avenue
Cambridge, MA 02140

INTRODUCTION

This expert statement is submitted in connection with *Sullivan et al. v. Saint-Gobain Performance Plastics Corporation*, 5:16-cv-00125-GWC. In it I review and rebut the Expert Report of Dr. Charles Mullin.[1] The opinions contained in this statement are based on my personal and professional knowledge. My conclusions are expressed to a reasonable degree of certainty and are consistent with the standards of the profession of environmental damage assessment. Staff at Industrial Economics, Incorporated (IEc) provided me with technical and administrative support in completion of this work, all under my direction.

I continue to gather information and the situation continues to evolve. As such, I reserve the right to update this opinion as new information becomes available or should Dr. Mullin express any additional or amended expert opinions.

SUMMARY OF MY OPINION ON MONETARY DAMAGES

In my expert report of December 15, 2017, I estimate two categories of monetary damage suffered by members of a proposed class of plaintiffs in this matter. These damages are being pursued, among other causes of action, under Vermont Statute 10 V.S.A. § 1410(c), which describes a cause of action for "unreasonable harm" to Vermont's groundwater:

> *Any person may maintain under this section an action for equitable relief or an action in tort to recover damages, or both, for the unreasonable harm caused by another person withdrawing, diverting or altering the character or quality of groundwater.*

Prior to the discovery of PFOA in the aquifer underlying the Town of Bennington and the Village of North Bennington, hundreds of residents relied on groundwater obtained from individual, private wells as their primary water source. The discovery of PFOA in the aquifer underlying these communities has resulted in actions by the State of Vermont to require some of these residents either to seal their wells and connect to one of two municipal water systems, or to operate point-of-entry treatment systems (POETs) to limit exposure to these compounds in their well water supply. These actions are being taken in order to protect public health going forward. Prior to this contamination event, groundwater in these communities met State and Federal drinking water standards, and was abundant. Absent this contamination event, there is no reason to conclude that residents with private wells would have needed to abandon their wells and/or connect to one of the two municipal systems.

[1] Expert Report of Charles Mullin, PhD, 11 May 2018.

Consistent with sound economic theory and common practice in the field of environmental economics (NRC, 1997), I consider the extent to which the services previously provided by groundwater in these communities have changed. I also consider whether the actions taken to-date in light of PFOA contamination of groundwater will fully address these lost services. I conclude that there are three categories of damages not addressed by the State's actions to protect public health. Specifically, I calculate monetary damages as:

1. The uncompensated "added costs" of quarterly water bills net of the costs no longer incurred in owning and operating a well, for those individual residences that were reliant on groundwater prior to the discovery of PFOAs.
2. A monetized value of damages for residents who cannot be connected to a municipal water system, and who will incur the disamenity of living in a home requiring a POET into the future.[2]
3. The cost of restoration actions to offset the harm all residents of these communities have experienced given the loss of a source of clean groundwater. For example, contamination of groundwater with PFOA leaves these plaintiffs more reliant on the existing municipal water systems and associated remaining water sources.

The monetary damages I calculate for these three categories of loss are summarized in Exhibit 1.

EXHIBIT 1 **PRESENT VALUE ADDED COST CALCULATIONS**

Added Costs for Well Owners Connecting to Municipal Systems	$4,904,276
Losses to Well Owners Not Connecting	$257,674
Replacement Cost for Lost Groundwater Services	$12,420,700
TOTAL	$17,582,651

In my initial report on class certification, dated September 1, 2017, I also conclude that, given a common set of factors, this group of harmed parties is well-

[2] In some cases it may be feasible to drill deeper wells or make other modifications to these plaintiffs' wells to assure safe drinking water (Barr Engineering, 2018). However, at this time it is not known how feasible such actions would be for this limited number of plaintiffs.

suited to be treated as a class for purposes of establishing damages under the Vermont Groundwater Protection Act and other causes of action. Specifically, the calculations performed, methodology utilized, assumptions made, and information relied upon are common to all of the Plaintiffs in this matter for these categories of loss. As such, addressing losses incurred by members of these communities as a group provides a reasonable and efficient means to establish monetary damages.

PURPOSE OF THIS EXPERT REPORT

The purpose of this Expert Report is to rebut critiques of my December 2017 expert opinion contained in the Expert Report of Dr. Charles Mullin (Mullin 2018). In his report Dr. Mullin concludes that "*proposed class members have material differences across multiple dimensions*" (Mullin, Page 12) that require individualized damage inquiries to establish damages. That is, he concludes that the plaintiffs' individual situations are too different to allow for establishment of damages on a class-wide basis. He also concludes that my total damage estimate for the proposed class is biased upward – in fact, he believes that the plaintiffs in this matter have significantly benefited from the need to switch to one of the two municipal water systems as a source of safe water following the widespread contamination of groundwater with PFOA. He also rejects my replacement cost approach, focusing on his opinion that the water utilities will be able to meet the demands placed on them by new users.

Dr. Mullin does not present an alternative present value damage calculation for either the added cost of well owners being forced to join the municipal system or for the replacement cost (or value) of lost groundwater services. Instead, he reviews my analysis, applies my added cost model, and provides a series of arguments as to why he believes my values are wrong. Below, I review and rebut those arguments.

SUMMARY OF THIS REBUTTAL OPINION

A summary of my opinions on Dr. Mullin's report follows:

- Dr. Mullin fails to acknowledge that groundwater contamination in Bennington has impaired proposed class members' ability to use groundwater.
- Dr. Mullin's conclusion regarding national trends in public water supplies that forms the foundation of his opinions fails to account for basic demographic changes. In coming to these conclusions, he confuses correlation with causation.
- In arguing that proposed class members exhibit too much "material variation" to be treated as a class, Dr. Mullin fails to provide a definition

or standard for that term. As a result, *any* differences he finds between proposed class members could arguably be considered a "material variation."

- In fact, proposed class members exhibit a limited set of well-defined common factors as relates to added cost and replacement cost damages in this case, and evaluation of such factors to calculate damages utilizes a common approach and methodology. As such, treatment of these harmed parties as a class would be equitable, efficient, and effective.
- For purposes of establishing damages to a class of similarly situated plaintiffs, it is reasonable to estimate total damages to the class based on a common methodology. Once total damages are determined, these can then be allocated based on simple, common factors. Dr. Mullin confuses these two steps in asserting that damages must be estimated on an individual basis.
- In criticizing my damage estimate for the proposed class, Dr. Mullin misrepresents and misunderstands my analysis, conclusions, and damages models.
- Dr. Mullin concludes that the PFOA contamination of groundwater in Bennington will (1) lower overall costs to residents who previously had access to clean and abundant groundwater; and (2) benefit the water authority and current ratepayers economically. In short, Dr. Mullin finds contamination of groundwater in Bennington has *benefited* the community.
- To reach his first conclusion, he makes flawed adjustments to my analysis to make it appear that the costs of owning and operating a well are greater than the cost of purchasing municipal water. However, the facts and documents he purports to rely on do not support his conclusions.
- As a result, Dr. Mullin's added cost analysis is not credible. More fatally, his results are inconsistent with the conclusions asserted by another defense expert witness, Trevor E. Phillips.
- Dr. Mullin's interpretation of an EPA study on the relationship between residential home values and the presence of hazardous waste sites, which he uses to support his results, is erroneous. A more informed reading of the results of that study and the associated hedonics literature finds little support for his conclusions.

- Dr. Mullin offers no insights into how damages should be estimated for residents forced to remain on POETs. He fails to consider the obvious use of the cost to connect these homes to the nearby municipal system as a measure of monetary damage.
- Regarding his second conclusion, in rejecting the need for restoration actions to offset the harm all residents of these communities have experienced given the loss of a source of clean groundwater, Dr. Mullin focuses almost entirely on the argument that the municipal water systems operated by the Town of Bennington and Village of North Bennington do not currently require additional capacity to meet the new demand created by adding former well-owners.
- Dr. Mullin argues, without any analysis, that there is an "optimal level of demand" (Mullin, Page 44) within the Town of Bennington and Village of North Bennington municipal water systems that is above current demand. As a result, he asserts that these systems will be made better off by adding users.
- He fails to address the broader issue of whether the improvements I identify to Bennington's municipal water system would serve to effectively compensate proposed class members for contamination of the Town's groundwater.
- I find no basis in Dr. Mullin's report to adjust my assumptions, model, methodology or conclusions.

MY QUALIFICATIONS TO OFFER THIS OPINION

As noted in my December 2017 Expert Report, I am a Principal of Industrial Economics, Incorporated (IEc). IEc is an economics and environmental policy consultancy located in Cambridge, Massachusetts. Founded in 1981, we are the leading environmental and natural resource damage assessment firm in the U.S. I served as a Managing Director and President of IEc from 2000 to 2011, and I have been a Principal with the firm for more than 25 years.

My work at IEc involves the use of economics to assign value to environmental change. As summarized in my December 2017 report, I am a leader in the field of groundwater damage assessment. I have worked on dozens of cases involving the assignment of monetary damages to individuals, classes of individuals, firms, and the public as a result of groundwater contamination and conflicts over groundwater use. I have testified in depositions and been accepted as an expert in Federal court on this topic. My clients include both plaintiffs and defendants in these matters.

My work has involved developing expert opinions on the appropriate use of economics to assess the value of groundwater and the economic harms resulting from a change in the services provided by groundwater. These assignments have also involved assessment of added costs to public and private entities, property value diminution, replacement costs, market value assessments, and assessment of option values. I am currently providing expert support in the assessment of groundwater damages at over a dozen sites nationwide, including several of the largest and most complex ongoing groundwater damage cases.[3]

My work frequently involves the application of hydrological, geological, economic, financial, and econometric principles, and an understanding of issues involved in the operation and maintenance of municipal water systems. I have been asked to lecture on the topic of groundwater damage assessment at professional legal conferences and law schools. I have developed guidance for several states on the conduct of groundwater damage assessment. I am recognized as an expert on this topic and on the broader topic of environmental economics by the U.S. Department of Justice, the U.S. Environmental Protection Agency, the U.S. Department of the Interior, the U.S. Department of Agriculture, and the U.S. Department of Energy (among other federal agencies), the International Court of Justice, and a wide-range of state Attorneys General and environmental agencies, Tribal entities, and private law firms. My expert opinions in this matter are based on this experience and demonstrated expertise.

Outside of this present matter, I have presented sworn deposition testimony in one case in the past four years. That testimony was for the U.S. Department of Justice and addressed the appropriate measurement of the economic benefits of environmental restoration (in the matter of: U.S. and the State of Wisconsin v. NCR Corporation, et al., Civil Action No. 1-CV-00910).

DISCUSSION OF OPINIONS

In this section I discuss the basis of my opinions.

DR. MULLIN FAILS TO ACKNOWLEDGE BASIC FACTS ASSOCIATED WITH CONTAMINATION OF GROUNDWATER IN BENNINGTON

Dr. Mullin states in his report:

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[3] For example, I recently directed studies to assess damages due to contamination of groundwater at the U.S. Department of Energy's Los Alamos Site (New Mexico); NASA's White Sands Test facility (New Mexico); the U.S. Department of Energy's Hanford Site (Washington State); various sites impacted by MTBE contamination (New Jersey); the Northrup Grumman Site (Long Island, New York); the Pohatcong Site (New Jersey); the Akzo salt mine collapse site (New York); and several other confidential sites nationwide.

> "*Correcting those flaws demonstrates that the remedies Saint-Gobain has agreed to fund have removed any alleged harm that may have occurred for the vast majority of proposed class members."* (emphasis added) (Mullin, Page 3)[4]
>
> "*Once remedied, the calculations demonstrate that proposed class members, on average, benefit from (are not harmed by) the transition to the municipal water supply."* (Mullin, Page 4)
>
> *"In this matter, an alleged "harmful event" is the presence of varying levels of PFOA in groundwater, allegedly impairing certain residents' ability to rely on groundwater wells."* (emphasis added) (Mullin, Page 12)

There is no question that the addition of PFOAs to the groundwater has impaired and will continue to impair Bennington residents' ability to use their wells – before their wells were contaminated with PFOAs, the residents could use their wells; now, they cannot. It is not clear why or on what basis Dr. Mullin questions the basic fact that residents' use of groundwater has been impaired, or how his misunderstanding of the facts of the case at hand biases his understanding of the resultant harms and damages.

DR. MULLIN'S ASSERTIONS REGARDING TRENDS IN RELIANCE ON PUBLIC WATER SUPPLIES FAIL TO ACCOUNT FOR BASIC DEMOGRAPHIC CHANGES

Dr. Mullin presents the argument that changes over time in the percentage of U.S. residents reliant on public supplies of water *"…[suggest] that public water supply is generally a less costly option than the private groundwater supply for most customers*" (Mullin, Page 18). This conclusion is not supported by the information Dr. Mullin presents, which in fact may imply the opposite.

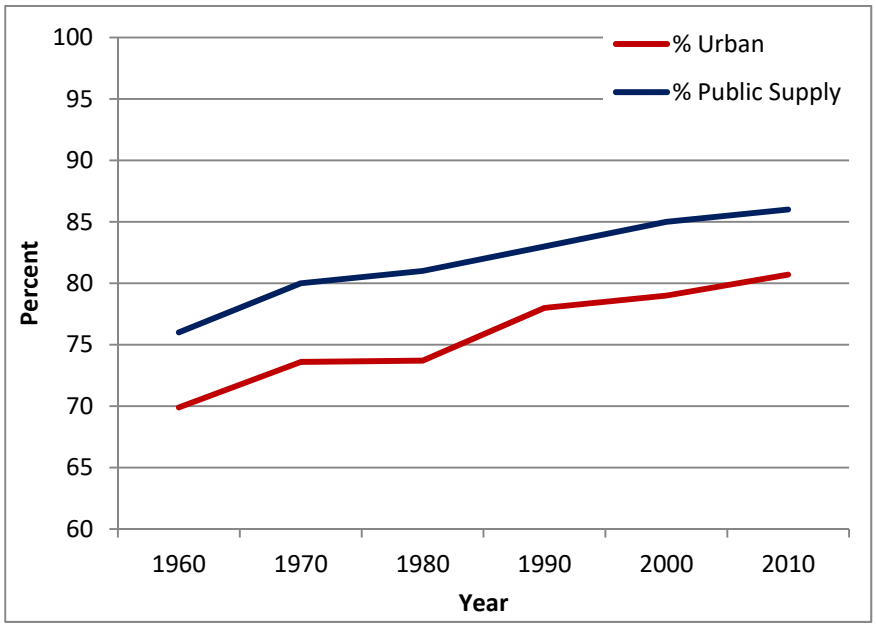
While a greater percentage of Americans rely on public water systems today than in the 1950s, this shift can be entirely explained by movement of Americans to more urbanized areas (see Exhibit 2). This demographic shift tells us nothing about preference for municipal water. In addition, Dr. Mullin fails to consider increased occurrence of groundwater contamination, more stringent drinking water standards, and aquifer depletion as separate factors leading to an increase in reliance on municipal systems – the first being the very factor faced by residents of Bennington.

Dr. Mullin's confusion between correlation and causation is repeated at several points in his report. For example, he states:

[4] Dr. Mullin does not note in his report which proposed class members he believes are harmed in this matter.

"First, there exists a strong revealed preference for the municipal water supply over groundwater wells. In general, the U.S. population has demonstrated a revealed preference for municipal water supplies; the number of groundwater wells has remained constant over the past 50 years, while the number of people using municipal water supplies has increased by more than 150 million. The same observation holds for Bennington; most residents with access to the municipal water supply choose it over maintaining a groundwater well." (Page 5)

EXHIBIT 2 TRENDS IN PERCENTAGE OF HOUSEHOLDS ON MUNICIPAL WATER AND PERCENTAGE OF POPULATION LIVING IN URBAN AREAS, 1960-2010.[5]



He goes onto state:

"Since 1955, the percentage of the US population relying on groundwater wells has been declining. In 1955, approximately 30% of the US population relied on groundwater wells for its water supply. By 2010, that number was only approximately 14%, as shown in Figure 6 below. Stated in counts, the number of individuals relying on groundwater wells has remained stable at about 40 million, while the number relying on municipal water supplies has grown from about 115 million in 1955 to about 270 million by 2010. In other words, the net incremental demand has been met by public water supply rather than groundwater supply. This

[5] Source: U.S. Census Bureau (population) and U.S. Geological Survey (2018) (percentage of households reliant on municipal water).

> *suggests that public water supply is generally a less costly option than the private groundwater supply for most consumers."* (Page 18)

Again, the pattern of an increase in reliance on municipal water supply over time at the national level has been driven by the increased urbanization of our nation. There is no indication that this trend was driven by a preference for municipal water as opposed to underlying economic factors. In fact, as Dr. Mullin notes above, the number of Americans relying on private well water has remained constant. As stated clearly by the United States Geological Survey, "*The trend of the past 70 years is of people moving to urban centers and is reflected in the shrinking numbers of self-supplied [i.e., private wells] people in the Nation*." (USGS, 2018)

Regardless of national trends toward urbanization, this case involves groundwater in Bennington, Vermont, where many residents have long and reliably used private wells for their water supply. While both Bennington and North Bennington have municipal systems, there has been no observable trend of residents shifting to those municipal systems, and Dr. Mullin cites no evidence of such a trend. As noted in my initial reports, observed behavior of residents of Bennington and North Bennington over the past decades is a clear indicator that there was little demand by residents with existing groundwater wells to connect to the municipal systems absent PFOA contamination. This is highlighted by the continued use of wells by the eight households Dr. Mullin identifies (Mullin, Page 22) who had easy access to municipal water, but chose to keep their wells.

Dr. Mullin notes that most homes with wells are in areas without access to municipal water. There is no reason that residents owning wells could not have asked the Town or Village to extend the systems to their streets. Given the substantial cost savings Dr. Mullin expects when a resident with a well connects to municipal water, added to the fact that he believes the municipal systems themselves would have benefited from additional customers, we would have expected to see pressure to join the systems by residents, and efforts by the Town and Village to extend their systems. The fact that there was no widespread demand to join the municipal systems supports a conclusion opposite to the one Dr. Mullin reaches.

Dr. Mullin also states:

> *"This fact also implies that almost all of the properties in the area of interest with historical access to the water line are currently relying on the municipal water line, demonstrating a revealed preference for municipal water among the proposed class members."* (Page 22)

This conclusion ignores multiple other factors that determine the use of public water supplies (e.g., historical connection to the municipal system, preferences of individual buyers, lot characteristics that preclude a well, availability of properties with desired characteristics). As such, the fact that many of the residents chose to live in residences served by municipal water does not negate the potential for financial losses to all residents, including residents who selected residences with private wells, nor does it imply anything about the preferences of these residents for municipal water.

DR. MULLIN PROVIDES NO STANDARD FOR "MATERIAL VARIATION"

Dr. Mullin rejects my conclusion that added cost and replacement cost damages in this case can be well addressed through class treatment. He bases his opinion on an argument that my analytical approach fails to account for "material variation" across proposed class members. For example, Dr. Mullin states:

> *"Moreover, because the proposed class members' individual rights and interests are at issue, the damage model should control for material differences among proposed class members. For this alleged harmful event, proposed class members have material differences across multiple dimensions, such as water usage, groundwater well depth, and access to capital markets. As discussed more fully in section III below, these material differences require individualized inquiries to attain reliable damage estimates for individual proposed class members. An average damage estimate masks these material differences among proposed class members and does not suffice. Reliance on average measures instead of individual evaluation would create disparate economic inequities amongst the proposed class members, generating unwarranted economic windfalls for some members and unwarranted economic penalties for others. As such, any alleged damages are not amenable to a reliable class-wide damages calculation."* (emphasis added) (Mullin, Page 12)

However, Dr. Mullin fails to establish an objective standard for evaluating "material differences" for purposes of determining if certification of a class of harmed parties would be an effective means to assist the Court in resolving these claims in a fair and efficient manner. As a result of his failure to articulate a standard against which he judges the viability of a class, Dr. Mullin's arguments become tautological. That is, in asserting that "*these material differences require individualized inquiries…,"* he effectively argues that any difference requires "individual inquires", and comes to the conclusion that such damages cannot ever be expressed on a class-wide basis. There is simply no way to know how any of the factors he cites enter into his analysis of "material difference", or how changes in those factors would affect his conclusions. For example, would two otherwise

identical properties with private wells that vary by a few feet in depth need distinct consideration in establishing damages? In reaching his conclusions he also fails to address how such inquires could be conducted efficiently given the large number of plaintiffs with relatively modest individual claims.

Finally, Dr. Mullin rejects my demonstrated opinion that these damages can be determined using a common methodology among all putative class members. Indeed, there are a limited set of common factors at play as relates to added cost and replacement cost damages in this case. Specifically, there are a common set of inputs that determine damages across the proposed class. For example,

- All but a few of the plaintiffs previously reliant on private wells will be moving to the municipal system.
- All of these plaintiffs will pay easily quantifiable – and largely similar – water bills following their connection to these systems.
- All of these private well owners had previously operated and maintained a groundwater well, which involves use of a standard set of equipment and an identical list of operating and maintenance cost items.
- All of the plaintiffs not moving to the municipal system will be forced to operate POETs indefinitely.[6]
- All of these plaintiffs in the Zone of Contamination will be precluded from drilling a well for potable purposes, indefinitely.
- All residents in the Zone of Contamination have experienced the loss of a source of clean groundwater, which leaves them more reliant on the existing municipal water systems and associated remaining water sources.

Finally, once residents with contaminated wells are connected to the municipal system, they will bear the same harm as the rest of the class.

Dr. Mullin fails to consider the simple use of a formula-based approach to overcome the problems he asserts exist in certifying a class of harmed parties in this matter. That is, after correctly estimating damages to the average proposed class member, allocation of damage payments could easily and efficiently be made based on a formula approach As such, the problems he raises are ones of fair allocation, not monetary damage assessment to a class of individual plaintiffs.

There is no reason that a class approach to damages cannot be effectively and efficiently applied in this matter. While Dr. Mullin argues with the magnitude of losses I calculate, his own calculations show that damages can be established on a

[6] In some cases it may be feasible to drill deeper wells or make other modifications to these plaintiffs' wells to assure safe drinking water (Barr Engineering, 2018). However, at this time it is not known how feasible such actions would be for this limited number of plaintiffs.

class-wide basis. Once damages are established, a simple formula can be used to allocate these damages. The fact that Dr. Mullin applies my damages model and simply varies a common set of factors to generate a revised damage estimate affirms the conclusion that the factors affecting the degree of monetary harm suffered by the plaintiffs in this matter are common, and thus damages can be efficiently and effectively established using a common and widely accepted methodology on a class-wide basis.

DR. MULLIN MISREPRESENTS MY ANALYSIS OF VARIATION IN EXPECTED COSTS OF MUNICIPAL WATER

Dr. Mullin states in his report:

> *"Mr. Unsworth's calculations cannot even identify which proposed class members may be harmed and which benefited, let alone measure the damages incurred for individual proposed class members who may be harmed."* (Mullin, Page 24, repeated on Page 25)

On this point Dr. Mullin misrepresents my analysis and testimony. As is clearly shown on Figure 8 of his own report, my damage model predicts that some residences reliant on private wells prior to the discovery of PFOA will experience a reduction in the cost of potable water once connected to the North Bennington municipal system. I also distinguish losses for those well owners with and without water softeners. As such, Dr. Mullin's above statement and similar statements in his report are false.

DR. MULLIN COMES TO THE UNSUPPORTABLE CONCLUSION THAT PLAINTIFFS WILL BENEFIT FROM PFOA CONTAMINATION OF BENNINGTON'S GROUNDWATER

Dr. Mullin reviews and critiques my analysis of added costs that private well owners who are being forced to switch to one of the two municipal systems will incur. He concludes that my damage estimates overstate actual financial losses. In fact, he believes that the plaintiffs in this matter will be better off as a result of the contamination of Bennington's groundwater resource and the related need to connect to the municipal systems to obtain a safe source of potable water.

In reaching this conclusion Dr. Mullin does not develop his own model of damages, but simply makes several changes to my analysis, all of which increase the assumed cost of owning and operating a well. As discussed further below, I do not agree with these changes. Below I describe the similarities and differences in our analyses, and address concerns I have with the assumptions he makes and the calculations he performs in reaching his conclusions.

Overview of Dr. Mullin's proposed changes to my analysis

Dr. Mullin makes two principal changes to my analysis: First, he asserts that I have understated certain costs; second, he asserts that I have failed to account for the cost of money in calculating the cost of replacing equipment associated with owning a well.

- Certain costs are the same between our analyses, including the cost of pressure tank replacement, pump replacement, water softener unit replacement, annual water softener operating costs, annual electricity costs, and the expected reduction in home insurance.
- Dr. Mullin assumes an annual bacteria testing expense ($14) for all Bennington and North Bennington residents reliant on well water. Since not all residents actually do this test, I assume that this test is only purchased by a portion of private well owners each year.
- Dr. Mullin adds an annual maintenance expense ($110 per year) for all residents. Since there is no evidence that residents with private wells incur this cost, I do not include it.
- Dr. Mullin adds an additional water test (for inorganics and radionuclides) for all residents ($145 every 5 years, or $29 per year). Since few residents actually incur these costs, and thus I do not include them in my calculations.

The effect of the changes Dr. Mullin proposes is to increase the assumed cost of owning a well, thus reducing the added cost of moving to municipal water, across the class, from $4.9 million to $1.1 million (both present values over 99 years).

Dr. Mullin goes further, to incorporate what he believes to be a necessary cost of capital to residents who were previously on wells. That is, he assumes that residents will either take on debt or lose investment income by paying for the required capital equipment I identify in my analysis. To derive costs under this scenario, he:

- Assumes a 12 percent average cost of capital.
- Effectively assumes that all of the plaintiffs pay for this investment over the operating lifespan of each capital item.
- These assumptions increase my estimate of pressure tank replacement costs by more than three-fold, from $40/year to $126/year (assuming a 25-year loan period).
- They increase my pump replacement cost by nearly three-fold, from $78/year to $209/year (assuming a 17-year loan period).

- They increase my water softener unit cost more than two-fold, from $133/year to $288/year (assuming a 15-year loan period).

The effect of this second set of changes to my analysis, when combined with the first set, is to flip from a total present value added cost of $4.9 million to a *benefit* of $5.9 million across the proposed class.

Below I summarize my criticism of these modifications, as well as several other assertions he makes in his report.

There is no need to adjust my analysis for "omitted costs"

As described above, Dr. Mullin adjusts my analysis for what he believes are omitted costs. Specifically, he increases the assumed cost of owning a well by assuming additional water testing and an annual maintenance cost for all well owners. I discuss these factors below.

Dr. Mullin argues that I omit the cost of a $14 bacteria test for residents who don't use water softeners.[7] However, in making this argument he ignores the fact that not all residents with wells buy this test on an annual basis. Instead, he asserts that this cost *should be* incurred, based on recommendations of the Vermont Public Health Lab and assertions regarding the potential for questionable groundwater quality based on a study conducted by the United States Geological Survey (USGS).[8]

In citing statistics from a USGS study to assert that groundwater quality was a concern of Bennington residents prior to the discovery of PFOA, Dr. Mullin fails to note that this study did not involve the testing of any wells in southwestern Vermont. Specifically, Dr. Mullin states that "*Despite water tests frequently identifying contaminants, such as E. coli, Mr. Unsworth omitted all water treatment costs*" (Mullin, Page 38). The clear inference he would have the jury draw is that well water tests conducted in Bennington frequently found contaminants such as E. coli, and thus we should assume all residents with wells incur the cost of testing for bacteria in their tap water each year.

However, this is not the case. The USGS study on which he relies considered data from 400 wells sampled nationally. Those authors indeed found 7.9 percent of

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[7] Based on personal communication with the State of Vermont Department of Health Laboratory, I assume that 20 percent of residents will do this test, and that those 20 percent are more likely to be reliant on shallower wells. As noted elsewhere in this opinion, the true percentage of residents testing their well water annually was on the order of five to 10 percent in 2017 (ballpark estimate provided by State of Vermont Health Laboratory (Larsen 2018).

[8] Leslie A. DeSimone, Pixie A. Hamilton, and Robert J. Gilliom, "Quality of Water from Domestic Wells in Principal Aquifers of the United States, 1991–2004: Overview of Major Findings" (US Geological Survey Circular 1332, May 2009), p. 14 Fig. 2(B).

sampled wells contain E Coli, and 34 percent contain total coliform bacteria. However, none of the wells included in the USGS study were in southwestern Vermont.[9] The few samples (approximately seven) from eastern Vermont either sample Crystalline rock aquifers, which do not cover the Bennington area of the map,[10] or glacial sand and gravel aquifers, which the map identifies as discontinuous within the Bennington region.[11] Recognition of this fact is important because the USGS report authors also recognize regional differences in contaminant frequencies, with porous, fractured aquifers of carbonate, quartzite, crystalline rock, and sandstone in Central Appalachia receiving the highest detection rates.[12]

For my analysis I am interested in accounting for *actual costs* incurred. While the State of Vermont does suggest, out of an abundance of caution, that annual water testing should be undertaken, most residents with wells in Bennington simply did not question – and had no reason to question – their groundwater water quality prior to the PFOA event. For example, from January 2011 to January 2018, the Vermont Department of Health recorded about 12,000 samples tested for E. Coli.[13] Only two percent of those samples that were sourced from private wells found presence of E. Coli. Even if the presence of E. Coli were detected, the next step would be additional testing and/or sampling to confirm the presence. Similarly, from 2003-2016, the State of Vermont Department of Health processed 74 tests for arsenic and 65 tests for nitrates in well water from Bennington. None of these samples were found to be above the MCL.

Dr. Mullin uses the same flawed understanding of the USGS report to argue that residents with wells *should have* tested their well water every five years for inorganic chemicals and gross alpha radiation. Again, he argues that this represents an omitted cost in my analysis. However, most residents do not do this test.[14] To support his presumed need for this expensive test, and thus to assert that this item should be added to the cost of owning a well, Mullin again relies on the same national USGS study, which found that 23 percent of sampled wells contained one or more contaminants at a concentration exceeding a human-health benchmark (Mullin, Page 38). However, despite obvious differences across aquifers and across the nation, Mullin again implies that the USGS results apply

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[9] DeSimone et al., p. 14 Fig. 2(B).

[10] DeSimone et al., p. 14 Fig. 2(A).

[11] DeSimone et al., p. 15

[12] DeSimone et al., p. 31

[13] This reflects samples from private sources of water (wells or springs) that were drawn from drinking water taps (i.e., excluding backyard spigots).

[14] Personal communication, Sille Larsen, Vermont Department of Health.

directly to Bennington's aquifer. A correct reading of the USGS findings shows that samples were not taken in southwestern Vermont. Importantly, only seven Vermont wells were sampled in this survey, all along the state's eastern border, and none tested positive for any inorganic contaminants above a human-health benchmark.[15]

Instead of relying on a national study, we can consider information from the Vermont Department of Health. In 2017, the Department sold 1,015 test kits for inorganics, 324 test kits for gross alpha levels, and 156 test kits for radon in water.[16] The Agency recommends well owners test inorganics plus gross alpha together, and recommends radon testing for groundwater samples only for those residences that tested positive for radon in air. Altogether, 1,495 test kits were sold for these three categories.[17] Note that inorganics and gross alpha are often tested together, thus indicating that fewer than 1,495 wells were actually tested in 2017. In addition, some residents would submit more than one test if they detected a problem.

There are 108,988 private wells in Vermont as of January 2018, according to the DEC. Assuming that the 1,495 test kits were ordered for 1,495 separate wells, we would expect this leaves us with no more than 1.4 percent of well owners who tested their wells for inorganics, gross alpha levels, or radon in 2017. By contrast, Dr. Mullin's cost estimates assume that this test is performed by 20 percent of all residents in a given year.

Since he applies limited national data to support his opinion regarding the baseline quality of well water in Bennington and North Bennington, presumably Dr. Mullin would also be concerned with the quality of municipal water at the tap. For example, many municipalities across the nation suffer from high lead levels, high arsenic levels, and disinfection by-products. As such, using Dr. Mullin's logic, residents on the municipal systems would incur the cost of testing their tap water annually. This is not something the average Bennington or North Bennington resident would likely do or need to do, and not something I incorporated in my analysis. Instead, I focus on what residents actually do.

Finally, Dr. Mullin argues that I should have included the cost of "*regular well maintenance*" (Mullin, Page 18). This adds $110 to his estimate of the annual cost of owning a well. Again, he presents no evidence that anyone in the proposed class *actually* incurred this cost of this maintenance (Mullin, Page 18). Instead, he

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[15] DeSimone et al., p. 17

[16] Personal communication, Sille Larsen, Vermont Department of Health.

[17] In some cases, home buyers will conduct these tests at the time of home inspection. As such, many of the tests sold may have been to prospective home buyers, not current residents.

relies on guidance regarding what well owners might want to do. Despite the suggestion that a well owner spends $110 each year, a rational individual would only conduct maintenance on an item if the cost of doing so was less than the expected savings. For example, if we assume a residential property is owned for 20 years, this owner would incur $2,200 in well maintenance expenses. A rational well owner would only incur this cost if he or she viewed it as likely to reduce operating or equipment costs. Thus, it is unreasonable to assume that *every* well owner would assume this cost, while it would be reasonable to assume that well owners who conduct maintenance benefit from longer life span of equipment.

Appropriate treatment of the cost of equipment replacement

The most significant difference in our added cost estimates results from Dr. Mullin's treatment of expected equipment costs. My damages model follows a standard expected value approach. That is, I compare the expected annual cost of owning a residence under two scenarios: one with a well and one with municipal water, and all other factors assumed to be equal. I then compare expected annual costs under these two scenarios against one another to calculate the present value damage. This approach provides a sound measure of the added cost of switching to municipal water for those plaintiffs in this case who previously had a private source of well water.

Instead of following this approach, Dr. Mullin assumes that each piece of equipment that needs to be purchased by a well owner will be financed over the operating life of that equipment. That is, in his calculations a $1,000 pressure tank effectively requires a payment of $126 per year for 25 years (for a total out of pocket expense of $3,150). He does not explain why this common household maintenance item should attract substantial financing charges -- in this case, for a term longer than a common mortgage -- while the over $13,000 in expected municipal water bills over this same period would attract no such financing cost.

The inconsistent treatment of these cost items leads Dr. Mullin to inflate the cost of owning a well relative to the cost of municipal water. While Bennington residents may need to finance capital expenses in their properties, some residents may also need to finance their water bills. In short, the annual magnitude of these cost items is not so different as to require different treatment in the analysis.

Given that I disagree with Dr. Mullin's application of an amortization factor to my analysis, I do not address whether he correctly estimated a weighted average cost of capital for Bennington households.[18] However, to the extent that he believes

[18] For example, Dr. Mullin assumes an aggressive (i.e., longer term) investment horizon of 30 years, using a flawed assumption that the median resident owning a well in Bennington is 46.1 years old. However, this median includes individuals below the age at which residents would

that this weighted average cost of capital should be used in calculating a net present value of damages over time, I disagree. The prices of residential property reflect the amenities of each property (e.g., number of bedrooms, size of lot, distance to employment), minus the cost of owning the property (e.g., heating, maintenance). As such, any changes in the cost of owning a property will be expressed through a change in the market price of the property. Since most buyers finance home purchases with mortgage debt, the proper rate to use to calculate net present value damages in this matter is the after-tax mortgage interest rate.

Dr. Mullin should have incorporated the cost of stranded equipment

As noted above, Dr. Mullin's analysis assumes a 15- to 25-year period over which Bennington residents with wells would make payments for required capital equipment. That is, rather than taking an expected value approach and differencing the annual expected value of the cost of owning and operating a well against the annual expected cost of paying for municipal water, he assumes that all investments in required equipment will need to be financed by the well owner.

Leaving aside other problems with this analysis (discussed above), proposed class members already own this equipment. To be true to his own assumptions, Dr. Mullin needs to assume that the harmed parties in this matter will continue to make payments (or forego interest on saving), on average, for the next 7.5-12.5 years (depending on the piece of equipment), in addition to now needing to also pay for municipal water. That is, in effect these proposed class members have stranded equipment that is still being paid for. These remaining payments will total, on average, *at least* $5,517 (based on Dr. Mullin's assumptions).[19] As such, Dr. Mullin understates the cost to these putative class members within his model by $5,517 dollars per residence.[20]

New water utility customers in the Town of Bennington will largely pay flat rates

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typically purchase homes, overstating the likely investment horizon and thus overstating the likely rate of return.

[19] The annual payments Dr. Mullin calculates for the three required pieces of equipment are $126.40, $209.06 and $288.04, for 25, 17 and 15 years, respectively. Assuming the average residence is halfway through each item's life span, this generates total remaining annual payments of $5,517.

[20] Put another way, the problem facing existing homeowners with wells that now need to be replaced with municipal water is not the choice of two identical homes moving forward, one with a well and one with municipal water, but a change in the future cost of operating the home *plus* the cost of paying back any loans for capital already purchased. While these homeowners can avoid, in Dr. Mullin's model, future operating costs of their wells, they are still burdened with past capital costs.

Dr. Mullin states that:

> *"Given that the water bills for all residents of the Village of North Bennington and about one-third of the residents of the Town of Bennington depend on usage, data on each household's daily water usage would be necessary to determine their water bills. It would thus be erroneous to calculate the water bill based on the average or typical rate of usage."* (Mullin, Page 21)

That is, Dr. Mullin opines that new customers of the Town of Bennington's water system will choose between having a meter (and thus paying based on the volume of water used), and not having a meter and paying based on a fixed quarterly charge. As such, he opines that some individuals with low water usage will benefit to a greater extent from movement to the municipal system (i.e., will pay less). (Mullin, Pages 20-21)

In fact, new customers of the system will largely be on the fixed price schedule.[21] That is, Dr. Mullin misunderstands that new water utility customers in the Town of Bennington, with the exception of several commercial and multi-family properties, will all be under a flat rate billing system. Thus, no adjustment to my analysis is needed to account for this factor.

Electricity usage

In asserting that there is "material variation" among the proposed class members, Dr. Mullin provides an exhibit that purports to show differences in annual electricity costs across the proposed class (see Exhibit 2 below, which reproduces Dr. Mullin's Figure 10). Leaving aside the fact that Dr. Mullin presents no evidence that anyone in the proposed class area exhibited the extremes he includes in this exhibit (e.g., had a well that was 600 feet deep and used 600 gallons per day of water), the exhibit highlights the fact that my cost assumption is reasonable. That is, while Dr. Mullin questions the accuracy of my annual electricity cost figure, as shown in Exhibit 3, I assume an average annual electricity cost of $47. This value is the same as that presented by Dr. Mullin for a 400 foot well pumping 300 gallons per day. Both of these factors are supported by the underlying evidence presented in both my report and by Dr. Mullin.

In any case, it is notable that Dr. Mullin accepts my cost estimate for electricity in his analysis.

[21] Personal communication, Jason Dolmetsch, MSK Engineering & Design.

EXHIBIT 3 ANALYSIS OF ANNUAL ELECTRICAL COSTS

Figure 10: Variation in electrical costs based on water usage and well depth

Water usage (gpd)	Yearly electricity costs					
600	$38	$56	$75	$93	$112	$131
500	$32	$47	$62	$78	$93	$109
400	$25	$38	$50	$62	$75	$87
300	$19	$28	$37	$47	$56	$65
200	$13	$19	$25	$31	$37	$44
100	$6	$9	$12	$16	$19	$22
Well depth (feet)	100	200	300	400	500	600

Other concerns I have with Dr. Mullin's opinion

- Dr. Mullin asserts "mathematical errors" in my analysis (Mullin, Page 4). However, the issues he raises reflect either a misunderstanding of my analysis or a difference of opinion. There are, in fact, no arithmetic errors in my calculations.

- Dr. Mullin expresses concerns with the sources of information used in my analysis, which are presented either in my report or in my spreadsheets used to make the calculations. He states "*Mr. Unsworth's sources include undocumented calls with contractors and web-based citations such as Angie's List*" (Mullins, Page 4). However, these are the same sources he relies upon (e.g., Mullin, Page 15, footnote 33), are among the sources commonly relied on in this field for obtaining cost information, and are the same sources homeowners commonly rely on in understanding their expected household maintenance costs.

- Dr. Mullin argues that I made a *"$200 understatement of the cost of replacing a well pump*" (Mullin, Page 39) by including a $738 estimate for well pump repair in my average for the cost of replacing a well pump. I do not agree that this is a mistake requiring correction, as one option commonly employed is to repair rather than replace the pump.

- Dr. Mullin states that "*a well's lifespan generally lasts 20-30 years with a number of factors affecting its functionality*" (Mullin, Page 16). However, the source he cites discusses wells going dry due to a falling water table. There is no evidence that there are issues of water table decline in Bennington.

In any case, he does not include these latter two cost factors in his revisions to my damage estimates.

DR. MULLIN'S ESTIMATE OF THE EXPECTED "COST SAVINGS" OF CONNECTING TO MUNICIPAL WATER LACKS CREDIBILITY

As noted, the price of a home reflects the amenities provided (e.g., number of bathrooms, distance to employment opportunities) minus the costs of owning the residence. As such, we would expect the value of a home to be lower, all else being equal, if the operating costs are higher. This would be particularly true for a cost item as obvious as a private well and at the magnitude of cost difference Dr. Mullin predicts. As such, we can assess the credibility of Dr. Mullin's opinion by considering the effect his asserted change in the cost of water would have on property values. He believes that proposed class members who previously relied on private wells will experience a $37/year to $587/year benefit (i.e., cost savings). Note that this benefit does not incorporate other benefits he asserts.[22] Incorporating these factors increases his estimated benefits to at least $252/year to $802/year.[23]

To place this value in context, Dr. Mullin's analysis implies that homes with wells would sell, all else being equal, for about $8,000 to $26,000 less than homes with municipal water.[24] This equates to a 5.8 percent to 18.6 percent difference in average home value.[25] There is no published literature or other information that indicates that homes on municipal water sell at this magnitude of premium. Fatally for Dr. Mullin's analysis, defense expert Trevor E. Phillips in this case considers four paired sales between homes with wells and those without, but fails to control for this factor.[26] As such, Mr. Phillips does not appear to share Dr. Mullin's opinion that there are substantial financial benefits of being on the municipal system.

DR. MULLIN'S REFERENCE TO AN EPA STUDY OF RESIDENTIAL HOME VALUES AND HAZARDOUS WASTE SITES IS ERRONEOUS

Dr. Mullin misrepresents the finding of a national study of the role that hazardous waste sites play in residential home values (EPA, 2016). He states:

> *"Second, Mr. Unsworth notes in his deposition that any harm should be capitalized into home values. Thus, if harm had occurred, then home*

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[22] Dr. Mullin states that he only adjusts my values for "*select errors*" (Mullin, Page 5).

[23] These values reflect adding those costs Dr. Mullin asserts are missing but which he does not include in his calculations (see Mullin, Pages 40-41).

[24] Calculation made using a 3.05 percent after tax mortgage interest rate.

[25] This is based on the median value of $141,300 for a single family residence in Bennington. (Town of Bennington, Vermont 2018). For comparison, the monthly payment on a $140,000, 30-year fixed term loan is $594.

[26] The four properties for which there were differences in sources of potable water between the subject property and the comparison properties are 8 Jennings, 62 Orchard, 790 Orchard, and 4 Carpenter (Phillips 2018).

> *values should have declined. An EPA study combining data across multiple contamination sites found that home values may initially decline 3%–6%, but, after remediation, return to their pre-event levels or higher (4% to 9% appreciation). Thus, the observable facts contradict Mr. Unsworth's erroneous opinion that proposed class members were, on average, harmed*." (Mullin, Page 5)

Dr. Mullin's conclusion about "*observable facts*" misleads the Court. First, the percentage declines in home values reported above are not for the Bennington community or for this PFOA event, but are averages from a set of studies conducted across the nation. Second, this papers abstract states:

> *"The results suggest significant heterogeneity in the price effects across sites, but on average reveal a 3% to 6% depreciation upon the discovery of a high profile release, and a similar appreciation after cleanup. These average effects diminish with distance, extending out to 2 or 3km from the site"(Guignet, Abstract).*

As such, Dr. Mullin overstates the conclusion these authors draw from their study by implying that residential property values will see an appreciation, above pre-release prices, following cleanup. Importantly, these authors also found a relationship of the degree of impact with distance. In the case of homes in the Zone of Contamination, distance to the site is zero.

The use of information from the existing literature requires adherence to the standards of "benefits transfer" (U.S. EPA, 2014), which Dr. Mullin ignores. In applying values from existing benefits studies, economists consider not only the quality of the underlying studies, but also the relevance of these studies to the task at hand. If the study being cited considered characteristics that are not consistent with the case at hand, adjustments can be made to account for those characteristics.[27]

In this case, the cited literature does not support the conclusions Dr. Mullin reaches. For example, some of the sites included in the EPA study did not have residences with closed private wells (see Kopp, Appendix F). In addition, for some of these sites the contamination in question is far from the properties being studied, as opposed to being imposed directly on property owners within a defined Zone of Contamination (Kopp, Appendix F).[28] Finally, there is no planned active remedy for the Bennington PFOA site; rather, alternative water sources are being sought for most affected residents, and PFOA will remain in groundwater above

[27] An example of a sound benefits transfer can be found in Kopp (2001).

[28] The impact of a disamenity, such as the presence of a hazardous waste site, is generally a negative function of the distance to the site.

levels of concern for many years to come. Thus, the conclusion to draw from this report is that home values in this case may be permanently depressed.[29, 30]

DR. MULLIN OFFERS NO INSIGHTS INTO HOW DAMAGES SHOULD BE ESTIMATED FOR RESIDENTS FORCED TO REMAIN ON POETS

I estimate losses for the limited number of proposed class members who will be forced to rely on POETs for the indefinite future to be *at least* as great as those proposed class members who are moving to the municipal system to obtain potable water. I come to this conclusion given the assumption that these individuals will ultimately get permanent relief from the contamination, either through connection to the municipal system or through a modification to their wells.[31]

Dr. Mullin states that "*…these proposed class members are not suffering any direct economic damages*" (Mullin, Page 42). That is, since he assumes that the defendant in this case will pay for the operation and maintenance of a POET until such time that the wells produce water below the State of Vermont action level of 20 ppt, he assumes no loss to these well owners. However, anomalously he notes that at least one named plaintiff does not trust the POET and thus purchases bottled water (Mullin, Page 43), indicating that these parties are experiencing an economic loss.

Despite determining my analysis to be speculative, Dr. Mullin makes no attempt to present an alternative theory of damage or a proposed approach to estimate losses to this group of plaintiffs. For example, as an alternative measure of loss we can estimate the cost to connect these parties to one of the two municipal systems. That is, while the State of Vermont partial consent decree may not require these connections, there is no reason why such relief could not be granted at the class level.

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[29] While the EPA study found that home prices might recover once a remedy is put in place, there is no economic theory that would support prices rising as a result of proximity to a disamenity such as contaminated groundwater.

[30] Note that the timing of when losses are calculated may matter. For example, if damages are properly expressed at the time of an adverse harm, the fact that the prices may recover, some day, would be irrelevant to the damage claim.

[31] While some well owners who cannot connect at this time to the municipal system may receive deeper wells or modifications to their wells to produce potable water, it is not known at this time if these solutions will work or when this relief will occur.

DR. MULLIN'S OPINION ON REPLACEMENT COSTS FOR THE CONTAMINATED GROUNDWATER RESOURCE MISCHARACTERIZES MY TESTIMONY AND FAILS TO ADDRESS THE ISSUE AT HAND

Dr. Mullin mischaracterizes my analysis of replacement costs for injured groundwater and misstates my testimony on this topic. He states:

> *"Another alleged 'harmful event' is the additional demands on the municipal water supply due to moving residents from groundwater wells to the municipal water supply."* (Mullin, Page 44)

This is not at all what I address in my report. As stated in my Expert Opinion, 10 V.S.A. § 1410(c) describes a cause of action for "unreasonable harm" to Vermont's groundwater:

> *"Any person may maintain under this section an action for equitable relief or an action in tort to recover damages, or both, for the unreasonable harm caused by another person withdrawing, diverting or altering the character or quality of groundwater*."

In short, the statute provides a mechanism for Vermont residents to be made whole by the party responsible for contamination of groundwater. As described in my initial Expert Opinion, groundwater provides a range of services to the public, some of which can be interfered with when groundwater becomes contaminated. The analysis I conduct and conclusions I reach with respect to replacement of the services previously provided by groundwater is consistent with this cause of action, and consistent with well-accepted practice in the field of environmental damage assessment (Lane et al., 2009).

In the absence of an active remedy to clean up groundwater at this site, and given the broad geographic Zone of Contamination, I calculate the cost of actions that could be taken to enhance the existing municipal system. These actions are intended to be above the "but for" condition and attributes of the system, as a means to provide a partial offset for the lost services associated with groundwater contamination. In contrast, Dr. Mullin's critique largely focuses on the irrelevant question of whether these systems were otherwise already "optimal" in their scale. Notably, he fails to address the broader issue of whether improvements to Bennington's municipal water system would effectively compensate members of the Bennington community for contamination of their groundwater and thus for the loss of this valuable resource.

Specifically, Dr. Mullin argues that there is an "optimal level of demand" (Mullin, Page 44) within municipal water systems. He states that "*…utilities build capacities beyond current needs. As the demand increases over time, utilities may reach a point where they need to expand capacity*" (Page 44). However, while asserting that these community water systems will unequivocally be better off, Dr.

Mullin presents no analysis or information that the marginal cost of adding users to these particular systems will be less than or greater than the current average cost of these systems. We simply won't know if this is the case until the new users are added and these systems have absorbed the cost of any additional demand and operating expenses.

In any case, contrary to Dr. Mullin's assertions, I do not argue that the addition of new customers will result in system capacity issues -- in fact, I conclude it will not[32] -- but focus instead on reliability of the system and source water quality.

In addition to missing the purpose of my analysis, Dr. Mullin also mischaracterizes my testimony and misconstrues the economic definition of cost-effectiveness (Mullin, Page 46). Specifically, Dr. Mullin implies that, if the restoration actions I proposed were "cost-effective", they would have already been implemented. First, government agencies rarely have the resources to implement all actions that could be viewed as *cost-beneficial* (i.e., those actions with benefits that exceed their costs).[33] Second, the purpose of the proposed restoration actions is to make the Bennington systems more reliable and better assure source water quality. These needs are in response to the loss of the groundwater resource, not ongoing system maintenance. As such, Dr. Mullin misunderstands the "but-for" condition for this analysis.

Dr. Mullin's misunderstanding of the purpose of the proposed replacement actions is highlighted by his assertion that residents who were on municipal water prior to the discovery of contamination experienced no loss, and thus require no compensatory actions to make them whole. He states:

> *Households transitioning from groundwater wells to the municipal water supply comprise only 12% of users. Thus, 88% of households allegedly benefiting from these proposed projects would receive a windfall, as they were already on the municipal water supply. In short, these projects have nothing to do with PFOA, pre-exist the discovery of PFOA, and do not constitute damages to the proposed class.* (Mullin, Page 47)

In short, Dr. Mullin believes that residents in the Zone of Contamination who were on municipal water prior to groundwater contamination have experienced no loss. This opinion is inconsistent with the published literature on public values for

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[32] As noted in my original report, publicly available data from North Bennington implies that treatment capacity could be an issue, but the utility is not claiming that to be the case at this time.

[33] Cost-effectiveness is a different economic concept than cost-benefit. Cost-effectiveness analysis is used to compare the cost of various actions which are intended to achieve the same outcome. I considered cost-effectiveness in my analysis by eliminating projects that would provide limited to no benefit as compared to those that were selected.

groundwater, as described in my initial Expert Report (NRC 1997). Losses to residents of a community with contaminated groundwater can arise solely from a reduction in groundwater quality not associated with direct loss of use. Bergstrom et al. (1996) demonstrate this broader view of groundwater services, in which people are harmed by a reduction in groundwater quality even when they are not current users of groundwater and there is no change in the available quantity of groundwater (Bergstrom 1996). This is the very situation we find in Bennington.

The replacement of groundwater services – including services provided to the public who are not currently reliant on groundwater – via the types of projects I include in my analysis is a common and widely accepted compensation approach (Lane et al., 2009; Ando et al., 2004). Dr. Mullin's limited consideration of system capacity, largely based on misplaced assertions, does not provide a meaningful or informed substitute analysis to address this category of harm.

Simply stated, as a result of the widespread PFOA contamination of the groundwater caused by the defendant, those within the Zone of Contamination have suffered an "unreasonable harm" in the loss of this important natural resource, which loss is recognized and compensable under Vermont's Groundwater Protection Act. As a result of this loss, the statutory remedy in Vermont allows those impacted to seek remedial action or damages.

Finally, Dr. Mullin further mischaracterizes my testimony in arguing that:

> *"Mr. Unsworth does not explain how the proposed class can seek damages on behalf of the Town of Bennington, generally, or the municipal water supply, specifically."* (Page 46)

Paragraph 55 also makes this statement:

> *"Further, these three projects would accrue to the benefit of the Town of Bennington municipal water supply, not the proposed class members. Mr. Unsworth does not explain how the proposed class can seek damages on behalf of the municipal water supply. If the plaintiffs cannot seek these alleged damages on behalf of the Town of Bennington, then they are not properly included."*

I make no such assertion in my report or deposition. I simply conclude that actions that can be taken by the Town of Bennington's water utility could serve to off-set the loss of a groundwater resource across a community of harmed parties. In this case the Town would simply be an agent to implement the projects, not a plaintiff.[34] That point was made clear at my deposition.

[34] Dr. Mullin selectively quotes from my deposition in other areas of his report, but appears to selectively miss my discussion of this issue (e.g., Pages 221, 5-8).

COMPENSATION

My 2018 rate for expert services in this case is $375/hour. My rate for testimony in this matter is the same.

INFORMATION RELIED UPON

In addition to the documents and information sources listed in my 15 December 2017 Expert Report, I considered and relied on the following documents in developing this opinion.

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